Fine Particulate Matter Hot-Spot Analysis Requirements for the I-94 Project

Date: August 5, 2013

The purpose of this paper is to provide the joint position of the Wisconsin Department of Transportation (WisDOT) and the Wisconsin Department of Natural Resources (WDNR) regarding the need for inclusion of a fine particulate matter ($PM_{2.5}$) hot-spot analysis as part of the Environmental Impact Statement (EIS) for the proposed I-94 transportation project.

Background

WisDOT, in cooperation with the Federal Highway Administration (FHWA), is preparing an EIS for the I-94 East-West Corridor in Milwaukee County. The I-94 study area includes approximately 2.85 miles of the I-94 freeway from 70th Street (west limit) to 25th Street (east limit). See Appendix A – Project Location Map.

Milwaukee County is currently in nonattainment for the 2006 $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS). However, WDNR requested that the U.S. Environmental Protection Agency (EPA) redesignate the area to attainment on June 5, 2012. A discussion regarding the potential for $PM_{2.5}$ impacts is required as part of the EIS for the project. A determination of whether or not a $PM_{2.5}$ hot-spot analysis is required must be made through the interagency air quality consultation process as identified in the appropriate sections of 40 CFR 93.105.

Several project alternatives that would be considered an "expanded highway" for purposes of making a $PM_{2.5}$ hot-spot analysis applicability determination are currently under consideration for detailed analysis in the EIS.

Hot-Spot Analysis Applicability Rules and Guidance

Federal rules and guidance have been established for determining $PM_{2.5}$ hot-spot analysis applicability. Rules and guidance that pertain to the proposed I-94 project include:

- 40 CFR 93.123(b)(1)i – v. indicates the types of projects for which a hot-spot demonstration is required.
- The EPA document: *"Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas"* issued in December 2010 (hereinafter referred to as the December 2010 guidance).
    - The Executive Summary of the December 2010 guidance which states, "This guidance is to be used by state and local agencies to conduct quantitative 'hot-spot analyses' for new or expanded highway or transit projects with significant increases in diesel traffic."
    - Section 2.2 of the December 2010 guidance which states, "A PM hot-spot analysis is not required for projects that are not of local air quality concern".
    - Section 2.2 of the December 2010 guidance which states, "See Appendix B for examples of projects that are most likely to be of local air quality concern as well as examples of projects that are not."

Basis for the Determination of Hot-Spot Analysis Applicability

On February 20, 2013, WisDOT and WDNR discussed $PM_{2.5}$ analysis for the I-94 project and agreed that:

- 40 CFR 93.123(b)(1)i which states, "New or expanded highway projects that have a significant number of or significant increase in diesel vehicles" is the project-type that applies to the proposed I-94 project for purposes of the $PM_{2.5}$ hot-spot analysis applicability determination;

- The proposed I-94 project meets the definition of an "expanded highway"; and

- The basis for determining whether the project would be of local air quality concern is, "Similar highway projects that involve a significant increase in the number of diesel transit buses and/or diesel trucks" as stated in Appendix B.2 of the December 2010 guidance.

Basis for an Appropriate "Significant Increase" Determination

In order to better define "significant increase", EPA is interested in the difference between the total daily diesel trucks for the No-Build and Build Scenarios, as stated in a 2/21/13 e-mail from WDNR to WisDOT (see Appendix B). WisDOT and WDNR agreed that the difference between the total diesel trucks in the 2040 Southeastern Wisconsin Regional Planning Commission (SEWRPC) forecasted average weekday traffic volumes for the 2040 No-Build and Build Scenarios would be the basis for determining if there is a significant increase in the number of diesel trucks.

Further discussions with EPA and FHWA led to a conclusion that the "open-to-traffic" year should also be included as part of the analysis along with the 2040 scenarios. For purposes of this analysis, it is assumed I-94 construction will be completed and open to traffic in 2025 if an expanded highway alternative is selected. In addition, WisDOT and WDNR originally used average annual weekday traffic (AAWDT) but decided to base the final analysis in this paper on average annual daily traffic (AADT) to be consistent with EPA guidance.

Project-Level Planning Assumptions

The latest planning assumptions must be used for the purposes of air quality conformity and hot-spot determinations per 40 CFR 93.110. The conservative planning assumptions include:

- There is a high probability that the diesel truck percentages in the corridor as a portion of the total vehicle mix will likely decline because the project corridor has little room for additional industrial/commercial development that will lead to additional diesel trucks. However, it will be assumed that the diesel truck percentages of the total vehicle mix will remain essentially the same over the SEWRPC forecast period.

- The percentage of diesel trucks in the vehicle mix in the I-94 corridor between the 70th St. and the Stadium Interchange remains the same for the entire corridor length.

- The percentage of diesel trucks in the vehicle mix in the I-94 corridor between the Stadium Interchange and 25th St. remains the same for the entire corridor length.

- The 2025 and 2040 No-Build forecasts assume that all projects in the SEWRPC Regional Transportation Plan (RTP), other than the I-94 project in this analysis, will proceed to construction. The 2025 and 2040 Build forecasts assume all projects in the SEWRPC RTP will be constructed.

Projected 2025 and 2040 I-94 Project Traffic Information

The current existing condition for the highway study area based on WisDOT highway data is as follows (see Appendix C):

Metric	70th Street to Stadium Interchange Segment (i.e., "West Segment")	Stadium Interchange to 25th Street Segment (i.e., "East Segment")
Average Annual Daily Traffic (AADT)	147,700	150,400
Percentage Diesel Trucks	6.7%	3.7%
Level of Service (LOS)	E – F	E – F

For purposes of the future year traffic projections, it is assumed I-94 construction will be completed and open to traffic in 2025 if an expanded highway alternative is selected. In addition, 2040 traffic projections are included as a horizon planning year.

2025 Traffic Projections

Future Year Scenario	Metric	70th Street to Stadium Interchange Segment (i.e., "West Segment")	Stadium Interchange to 25th Street Segment (i.e., "East Segment")
2025 No-Build Scenario (See Appendix C)	Projected AADT	159,700	165,350
	Projected Percentage Diesel Trucks	6.7%	3.7%
	Projected Number of Diesel Trucks	10,700	6,118
	Level of Service (LOS)	E – F	E – F
2025 Build Scenario (See Appendix C)	Projected AADT	174,800	177,600
	Projected Percentage Diesel Trucks	6.7%	3.7%
	Projected Number of Diesel Trucks	11,712	6,571
	Level of Service (LOS)	D or better	D or better
Comparison Between No-Build and Build Scenarios	Projected AADT Increase	15,100	12,250
	Projected Increase of Diesel Trucks	1,012	453
	Projected Percentage Increase of Diesel Trucks	9.5%	7.4%

2040 Traffic Projections

Future Year Scenario	Metric	70th Street to Stadium Interchange Segment (i.e., "West Segment")	Stadium Interchange to 25th Street Segment (i.e., "East Segment")
2040 No-Build Scenario (See Appendix C)	Projected AADT	166,400	172,000
	Projected Percentage Diesel Trucks	6.7%	3.7%
	Projected Number of Diesel Trucks	11,149	6,364
	Level of Service (LOS)	E – F	E – F
2040 Build Scenario (See Appendix C)	Projected AADT	186,900	193,500
	Projected Percentage Diesel Trucks	6.7%	3.7%
	Projected Number of Diesel Trucks	12,522	7,159
	Level of Service (LOS)	D or better	D or better
Comparison Between No-Build and Build Scenarios	Projected AADT Increase	20,500	21,500
	Projected Increase of Diesel Trucks	1,373	795
	Projected Percentage Increase of Diesel Trucks	12.3%	12.5%

Projected level of service, which provides a measure of congestion, is also provided with the 2025 and 2040 traffic projections. The Highway Capacity Manual (HCM) and American Association of State Highway and Transportation Officials (AASHTO) Geometric Design of Highways and Streets ("Green Book") list the following levels of service:

- LOS A – Free Flow
- LOS B – Reasonably Free Flow
- LOS C – Stable Flow
- LOS D – Approaching Unstable Flow
- LOS E – Unstable Flow
- LOS F – Forced or Breakdown Flow

The HCM is a publication of the Transportation Research Board of the National Academies of Science. Level of service is expected to improve from E – F under a No-Build Scenario to D or better under a Build Scenario in both 2025 and 2040.

Proposed I-94 Project Diesel Truck Increase Significance Determination

There is no guidance provided by EPA for determining when an increase in diesel trucks reaches the level of "significant" for expansion of existing highways. WisDOT and WDNR provide the following examples of why the two agencies have concluded that the numbers cited in the previous discussion are not indicative of a significant diesel truck increase.

1. **The proposed I-94 project should not be considered a project of local air quality concern because it is very unlikely that the Build Scenario will degrade the local air quality more than the No-Build Scenario**.

   Local air quality, including $PM_{2.5}$, is directly related to emission sources, including diesel trucks within the area, not the activity on a single highway. The number of diesel trucks moving through the east-west corridor will remain the same with or without I-94 undergoing a build expansion. This is because the need that generates these trips remains the same, as there is little room for additional development within the corridor. Further, the proposed project does not provide additional new access to I-94.

   The SEWRPC 2025 and 2040 Forecast AADT numbers for the 2025 and 2040 Build Scenarios are based on the assumption that this is not "new" or "induced" traffic, but rather that a substantial proportion of the increased traffic on I-94 is likely local traffic that would otherwise use parallel east-west surface arterials due to increasing congestion levels on I-94 if no additional capacity is provided.

   The year 2025 forecasted average daily traffic diversion under the Build Scenario relative to the No-Build Scenario schematic in Appendix D developed based on the 2035 Regional Transportation System Plan shows the expected traffic diversion related to the No-Build condition ranges from 6,550 to 16,050 AADT and 275 to 650 diesel vehicles throughout the I-94 corridor. A substantial portion of this diversion (1,900 to 4,750 AADT, 40 to 145 diesel vehicles) occurs on parallel roadways within 0.4 miles of I-94. In fact, this increase in diesel truck trips on the surface streets due to a No-Build Scenario will likely generate more emissions than an I-94 Build Scenario as a result of increases in starting, stopping and idling at signalized intersections as congestion on surface streets worsens from additional traffic diversion.

   Under the No-Build Scenario, the current level of congestion on I-94 will likely increase. This will further increase diesel $PM_{2.5}$ emissions in the immediate corridor area as a result of increased starting, stopping and idling on the interstate, as well as lower operating speeds, all resulting in the emission generators remaining in the area for a significantly longer period of time. Conversely, the Build Scenario is projected to increase the level of service from F to D, substantially reducing the amount of starting, stopping and idling on the interstate.

   MOVES2010a Regional Sensitivity Analysis, a document published by the John A. Volpe National Transportation Systems Center, discusses the sensitivity of various input parameter effects on emissions rates using the Motor Vehicle Emissions Simulator (MOVES) computer model. The Executive Summary of the document indicates emissions rates associated with LOS E showed a larger variation than LOS B, C or D, while emissions rates associated with LOS F were significantly higher. See Appendix E – *MOVES2010a Regional Sensitivity Analysis* Executive Summary. Based on this document, it is intuitive that the Build Scenario will improve the local air quality, while the No-Build Scenario will worsen local air quality even though there will be a small percentage of diesel traffic returning to the I-94 corridor from parallel east-west local streets.

2. Based on declines in $PM_{2.5}$ emission factors, the projected increases in diesel trucks are not significant.

Based on prior MOVES modeling conducted by WDNR for a highway project in Wisconsin, $PM_{2.5}$ emissions factors decreased on average by 25.9% for gasoline and light-duty diesel vehicles from 2015 through 2030 and by 82.7% for heavy-duty diesel vehicles over the same time period. In addition, emissions factors decreased on average by 24.6% for gasoline and light-duty diesel vehicles from 2015 through 2040 and by 93.1% for heavy-duty diesel vehicles over the same time period. See Appendix F – Motor Vehicle Emissions Simulator (MOVES) Emission Factor Analysis. In light of the projected declines in $PM_{2.5}$ emissions factors, the projected I-94 daily diesel truck increases do not appear to be significant. The number of diesel trucks is projected to increase by 453 – 1,012 and 795 – 1,373 in 2025 and 2040, respectively, for the No-Build vs. Build Scenarios.

The prior modeling assumed no major congestion for the analysis years (2015, 2030, and 2040). Given that the I-94 corridor is currently experiencing major congestion for parts of the day and the level of service of additional segments of I-94 will continue to decrease under the No-Build Scenario, it can be assumed actual emission factor decreases will be even greater when comparing the No-Build to the Build Scenarios for the I-94 project.

3. Rural – Urban $PM_{2.5}$ differences do not support this project being labeled as a "project of significant air quality concern."

Average hourly $PM_{2.5}$ ambient concentrations at WDNR's College Avenue monitoring site (*ID: 550790058*) in Milwaukee, an urban condition, are representative of ambient concentrations in the area of the proposed I-94 project. The College Avenue monitoring site is approximately 270 meters from I-94 (see Appendix G). Average hourly $PM_{2.5}$ ambient concentrations at the Horicon monitoring site (*ID: 550270001*) represent a rural condition with no localized traffic impacts. A detailed comparison between the two sites is shown in Appendix H. Upon a request by EPA, wind roses were developed for WDNR's College Avenue monitoring site based on meteorological data from General Mitchell Airport in Milwaukee collected by the National Weather Service (NWS) (see Appendix I). The airport is approximately 1 – 2 miles from WDNR's College Avenue monitoring site.

A comparison of the two monitoring sites, based on 2011 air monitoring data, indicates the average daily $PM_{2.5}$ differences by season are as follows:

	Winter	**Spring**	**Summer**	**Fall**
Daily Average $PM_{2.5}$ Concentration – College Avenue	15.11 µg/m^3	12.45 µg/m^3	15.30 µg/m^3	13.53 µg/m^3
Daily Average $PM_{2.5}$ Concentration – Horicon	11.68 µg/m^3	8.89 µg/m^3	8.76 µg/m^3	7.99 µg/m^3
Difference (College Ave. – Horicon) (i.e., potential traffic culpability)	3.43 µg/m^3	3.56 µg/m^3	6.54 µg/m^3	5.54 µg/m^3

These are small seasonal differences in $PM_{2.5}$ concentrations considering there is a major freeway located near the College Avenue monitoring site (i.e., approximately 270 meters) and Horicon is a rural site. While it would be desirable to use 2011 traffic count data to compare with the $PM_{2.5}$ monitoring data, I-94 (generally between the Marquette Interchange and State Highway 16) was resurfaced in Milwaukee and Waukesha Counties in 2010 and 2011 impacting the traffic counts in those years. The most recent traffic count data without this impact is for the year 2009 and is included in Appendix C. A comparison of forecast year 2025 AADT volumes to year 2009 traffic count data shows a maximum 18.3% increase

from 147,700 to 174,800 AADT along I-94 east of Hawley Road under the Build Scenario and a maximum 9.9% increase from 150,400 to 165,350 AADT along I-94 east of the Stadium Interchange under the No-Build Scenario.

If it is assumed that the **entire** difference between the rural and urban $PM_{2.5}$ concentrations is from local traffic impacts, which is an unrealistic, but worst-case assumption, the average difference in daily $PM_{2.5}$ concentrations between College Avenue and Horicon, which would be indicative of potential traffic culpability, may be as follows in 2025:

Scenario	Potential Traffic Culpability (*Average Difference in Daily $PM_{2.5}$ Between College Avenue and Horicon*) - 2025			
	Winter	Spring	Summer	Fall
Build Scenario (*18.3% Increase*)	4.06 µg/m^3	4.21 µg/m^3	7.74 µg/m^3	6.55 µg/m^3
No-Build Scenario (*9.9% Increase*)	3.77 µg/m^3	3.91 µg/m^3	7.19 µg/m^3	6.09 µg/m^3
Difference	0.29 µg/m^3	0.30 µg/m^3	0.55 µg/m^3	0.46 µg/m^3

For 2040, the comparison of forecast year 2040 AADT volumes to year 2009 traffic count data shows a maximum 26.5% increase from 147,700 to 186,900 AADT along I-94 east of Hawley Road under the Build Scenario and a maximum 14.4% increase from 150,400 to 172,000 AADT along I-94 east of the Stadium Interchange under the No-Build Scenario.

If it is assumed that the **entire** difference between the rural and urban $PM_{2.5}$ concentrations is from local traffic impacts, which is am unrealistic, but worst-case assumption, the average difference in daily $PM_{2.5}$ concentrations between College Avenue and Horicon, which would be indicative of potential traffic culpability, may be as follows in 2040:

Scenario	Potential Traffic Culpability (*Average Difference in Daily $PM_{2.5}$ Between College Avenue and Horicon*) - 2040			
	Winter	Spring	Summer	Fall
Build Scenario (*26.5% Increase*)	4.34 µg/m^3	4.50 µg/m^3	8.27 µg/m^3	7.01 µg/m^3
No-Build Scenario (*14.4% Increase*)	3.92 µg/m^3	4.07 µg/m^3	7.48 µg/m^3	6.34 µg/m^3
Difference	0.42 µg/m^3	0.43 µg/m^3	0.79 µg/m^3	0.67 µg/m^3

These small seasonal increases in traffic culpability between the Build and No-Build Scenarios lead to the conclusion that the forecasted change in traffic for the I-94 corridor project is not significant as it relates to future $PM_{2.5}$ concentrations.

The latest design value, based on 2010 – 2012 data, for the Horicon site is 25.5 µg/m^3 and for the College Avenue site is 30.3 µg/m^3, both well below the 2006 $PM_{2.5}$ NAAQS of 35 µg/m^3. This is a design value difference of only 4.8 µg/m^3 between the two sites. If the introduction of a major freeway, with 147,700 AADT results in worst-case a 4.8 µg/m^3 difference, then an increase of traffic to 177,600 AADT in 2025 and 193,500 AADT in 2040 may result in approximately a 5.8 µg/m^3 and 6.3 µg/m^3 difference, respectively, with a predicted design value of 31.3 µg/m^3 and 31.8 µg/m^3 in 2025 and 2040, respectively. Again, this is "worst-case" because it assumes the entire difference in design values between Horicon and College Avenue is solely from the freeway. The projected 2025 design value of 31.3 µg/m^3 and projected 2040 design value of 31.8 µg/m^3 is still below the $PM_{2.5}$ NAAQS of 35 µg/m^3. Again, we know that

traffic is not the sole contributor to the rural – urban difference. In addition, $PM_{2.5}$ concentrations have been trending downwards in Milwaukee, as discussed later in the paper

4. Regional improvements in air quality in the Milwaukee area should be considered.

In addition to the joint-agency position that the projected increase in diesel truck traffic is not significant, WisDOT and WDNR stress that there are numerous transportation-related mitigation measures currently being implemented to improve air quality in southeast Wisconsin. These mitigation measures are summarized in Appendix J. These WisDOT-sponsored measures, along with other WDNR and EPA initiatives, have resulted in measurable improvements in the air quality of southeastern Wisconsin as evidenced by the last seven $PM_{2.5}$ design values for the Milwaukee-Racine Nonattainment Area shown in the following table.

Years	Milwaukee-Racine Nonattainment Area
2004 – 2006	41 µg/m^3
2005 – 2007	41 µg/m^3
2006 – 2008	37 µg/m^3
2007 – 2009	37 µg/m^3
2008 – 2010	33 µg/m^3
2009 – 2011	32 µg/m^3
2010 – 2012	30 µg/m^3

The NAAQS for 24-hour $PM_{2.5}$ is 35 µg/m^3. The design values shown in the table are the highest recorded concentrations from various monitors in the three-county nonattainment area.

5. Comparison to the Zoo Interchange Project

A qualitative $PM_{2.5}$ hot spot analysis was conducted for the Zoo Interchange project in Milwaukee County, utilizing the "Transportation Conformity Guidance for Qualitative Hot-spot Analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas" issued March 2006. Traffic data used for that analysis is shown below.

Project Segment	Existing 2011 AADT	Projected Year 2035 AADT
North Leg	144,000	197,000
East Leg	143,000	173,000
South Leg	127,000	222,000
West Leg	125,000	179,000
Percentage of Diesel Trucks – West	8.1%*	8.1%
Percentage of Diesel Trucks – South	9.3%*	9.3%

* HDDV Truck Percentages are not expected to change.
* Information taken from $PM_{2.5}$ Qualitative Hot-Spot Analysis for Interstate I-94, and U.S. Highway 45 (Zoo Interchange) Milwaukee County, WI.

Interagency consultation for the Zoo Interchange project began in May 2011. The Interagency Consultation Team determined that based on available traffic data, the Zoo Interchange project was a "project of air quality concern" since it met the definition in 40 CFR 93.123(b)(1)(i) - "New or expanded highway projects that have a significant number or significant increase in diesel vehicles." From the

qualitative analysis it was determined that the Zoo Interchange project met all project level conformity requirements and that the Zoo Interchange project would not cause or contribute to a new violation of the $PM_{2.5}$ NAAQS, or increase the frequency or severity of a NAAQS exceedance.

When compared with the Zoo Interchange project, the proposed I-94 project is different in several key regards:

- The projected AADT for the proposed I-94 project is lower than the projected AADT for the Zoo Interchange (maximum of 177,600 for the east leg of the proposed I-94 project versus 222,000 for the south leg of the Zoo Interchange).

- The percent of diesel traffic is lower on the proposed I-94 project (6.7% and 3.7% versus 9.3% and 8.1% for the Zoo Interchange).

- The increase in diesel vehicles, as a result of the above values, is significantly different. The increase for the Zoo Interchange ranges from 4,374 for the west leg to 8,835 for the south leg. The increase for the proposed I-94 project ranges from 453 to 1,012 for the two legs in 2025 Build Scenario and 795 to 1,373 for the two legs in the 2040 Build Scenario.

- The order of magnitude of this increase from the I-94 project to the Zoo Interchange project is eight to ten times more diesel traffic in 2025 and five to seven times more diesel traffic in 2040.

Based on these differences between the two projects, it is evident that the prior determination that the Zoo Interchange was a "project of air quality concern" has no bearing on the determination for the proposed I-94 project.

Conclusion

Based on the data and conservative evaluation provided in this paper, WisDOT and WDNR have determined the expanded highway alternatives for the proposed I-94 project will not result in a significant increase in diesel vehicles. The proposed project is therefore not considered a project of local air quality concern per 40 CFR 93.123(b). It is the joint WisDOT and WDNR position that a $PM_{2.5}$ hot-spot analysis is not required for the I-94 East-West Corridor EIS.

APPENDIX A

Project Location Map


Wisconsin Ave
Blue Mound Rd
Mitchell Blvd
41
Wisconsin Ave
East Terminus
35th St
94
25th St
27th St
Menomonee River
West Terminus
94
Hawley Rd
Fredrick Miller Way
341
Canal St
76th St
70th St
68th St
Brown Deer Rd.
100
BAYSIDE
N
FOX POINT
181
N. 76th St.
Green Bay Ave
43
57
45
WHITEFISH BAY
145
100
Capitol Dr.
190
SHOREWOOD
Fond du Lac Ave.
41
43
32
North Ave.
Lisbon Ave.
41
18
Bluemound Rd.
18
94
794
MILWAUKEE
70th St
341
National Ave.
PROJECT LOCATION
45
94
S. 108th St.
S. 76th St.
Home Ave
24
32
ST. FRANCIS
100
894
43
Forest
Layton Ave.
General Mitchell International Airport
241
CUDAHY
Loomis Rd.
36
38
S. 27th St.
94
S. Howell Ave.
32
Lake Michigan

APPENDIX B

“Significant Increase” E-mail from WDNR to WisDOT

Hoch, Joseph A - DNR

From: Hoch, Joseph A - DNR
Sent: Thursday, February 21, 2013 3:14 PM
To: Waldschmidt, Jay - DOT
Subject: DNR - DOT Meeting Follow-up

Hi Jay,

Nice meeting you at the meeting yesterday.

I had a chance to speak with EPA Region V yesterday regarding the requirements of 40 CFR 93.123 (b)(1)(i), which reads as follows:

(1) The hot-spot demonstration required by § 93.116 must be based on quantitative analysis methods for the following types of projects:
(i) New highway projects that have a significant number of diesel vehicles, and expanded highway projects that have a significant increase in the number of diesel vehicles;

Basically, regardless if the fleet mix (i.e., percentage) of diesel vehicles stays the same, EPA would be interested in the difference in traffic counts between the build and no-build scenarios. For example, if the percentage of diesel vehicles stayed constant at 6.8%, but traffic increased (i.e., capacity expanded) by 20,000, as a hypothetical example, from the non-build to the build scenario, that would be an increase of 1,360 diesel vehicles due to the project.

From the meeting yesterday, a map of 2040 estimated traffic counts was provided for the no-build scenario with numbers ranging from 175,000 – 186,000 AADT. Can you or SEWRPC produce something similar under the build scenario? Also, can you do it for multiple years besides just the 2040 year?

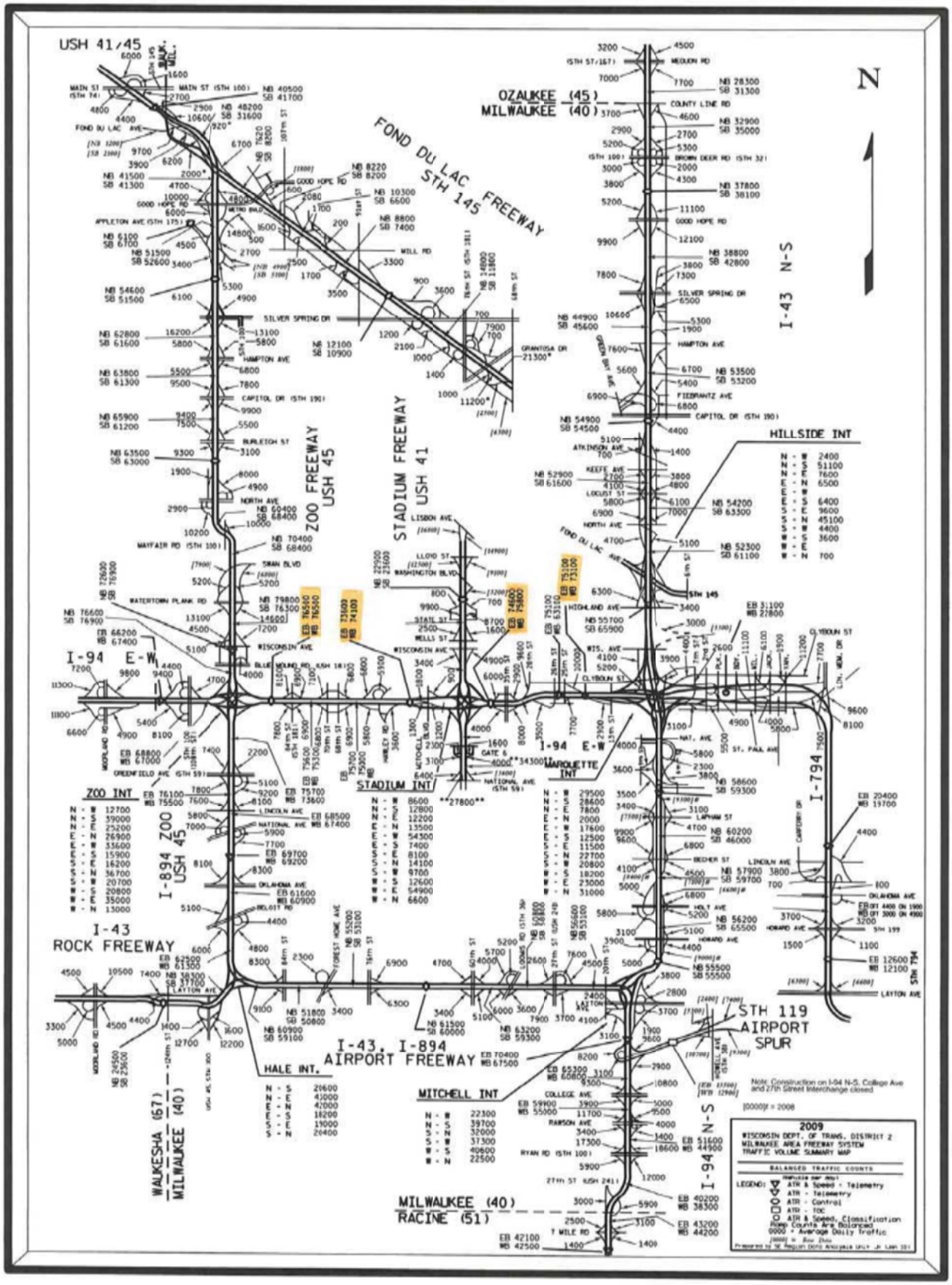
Please feel free to give me a call or setup a meeting if you would like to discuss things further before our scheduled March 1st meeting.

Thanks,
Joe

Joseph Hoch
Regional Pollutants and Mobile Source Section Chief
Wisconsin Department of Natural Resources
(608) 267 - 7543
Joseph.Hoch@wisconsin.gov

APPENDIX C

Existing Condition Traffic Data & 2025 and 2040 No-Build and Build Condition Forecast Volumes


USH 41/45
FOND DU LAC FREEWAY STH 145
ZOO FREEWAY USH 45
STADIUM FREEWAY USH 41
I-43 N-S
I-94 E-W
I-894 ZOO USH 45
I-43 ROCK FREEWAY
I-43, I-894 AIRPORT FREEWAY
I-94 N-S
I-794
STH 119 AIRPORT SPUR
OZAUKEE (45)
MILWAUKEE (40)
WALKESHA (67)
MILWAUKEE (40)
MILWAUKEE (40)
RACINE (51)
HILLSIDE INT
ZOO INT
STADIUM INT
MARQUETTE INT
HALE INT.
MITCHELL INT
N
2009
WISCONSIN DEPT. OF TRANS. DISTRICT 2
MILWAUKEE AREA FREEWAY SYSTEM
TRAFFIC VOLUME SUMMARY MAP
BALANCED TRAFFIC COUNTS
LEGEND:
ATR & Speed - Telemetry
ATR - Telemetry
ATR - Control
ATD - TOC
ATR & Speed, Classification
Ramp Counts Are Balanced
0000 = Average Daily Traffic
Note: Construction on I-94 N-S, College Ave and 27th Street Interchange closed
[0000]# = 2008

The truck percentage was collected by Wavetronix count equipment (length base)

I-94 Between 84th Street and70th Street (Site# 401919)

		Average
EB	7.43%	6.69%
WB	6.00%	

Date	VOLUME	CLASS COUNT (BIN LENGTHS IN FEET)					Total Percent Trucks	Light Trucks	Heavy Trucks	Day of Week	Direction
		C1 9	C2 24	C3 40	C4 75	C5 255					
1/30/2013	66,828	668	59,579	4,179	1,760	642	9.85%	6.25%	3.59%	Wednesday, January 30, 2013	EB
	71,648	3,491	63,200	3,048	1,484	425	6.92%	4.25%	2.66%		WB
	138,476	4,159	122,779	7,227	3,244	1,067	8.33%	5.22%	3.11%		
1/31/2013	74,135	1,487	66,527	3,609	1,877	635	8.26%	4.87%	3.39%	Thursday, January 31, 2013	EB
	79,984	3,838	70,582	3,445	1,653	466	6.96%	4.31%	2.65%		WB
	154,119	5,325	137,109	7,054	3,530	1,101	7.58%	4.58%	3.00%		
2/1/2013	78,365	924	70,426	4,035	2,199	781	8.95%	5.15%	3.80%	Friday, February 01, 2013	EB
	80,277	4,437	70,253	3,483	1,704	400	6.96%	4.34%	2.62%		WB
	158,642	5,361	140,679	7,518	3,903	1,181	7.94%	4.74%	3.20%		
2/2/2013	62,921	795	59,312	1,906	706	202	4.47%	3.03%	1.44%	Saturday, February 02, 2013	EB
	66,438	2,633	61,474	1,636	578	117	3.51%	2.46%	1.05%		WB
	129,359	3,428	120,786	3,542	1,284	319	3.98%	2.74%	1.24%		
2/3/2013	45,268	445	43,549	843	289	142	2.81%	1.86%	0.95%	Sunday, February 03, 2013	EB
	48,132	1,883	44,828	976	317	128	2.95%	2.03%	0.92%		WB
	93,400	2,328	88,377	1,819	606	270	2.89%	1.95%	0.94%		
2/4/2013	63,359	1,849	55,722	3,457	1,711	620	9.14%	5.46%	3.68%	Monday, February 04, 2013	EB
	69,505	3,384	60,778	3,366	1,540	437	7.69%	4.84%	2.84%		WB
	132,864	5,233	116,500	6,823	3,251	1,057	8.38%	5.14%	3.24%		
2/5/2013	71,288	957	64,252	3,541	1,855	583	8.53%	5.11%	3.42%	Tuesday, February 05, 2013	EB
	77,177	3,952	67,790	3,371	1,661	403	7.04%	4.37%	2.67%		WB
	148,465	4,909	132,042	7,012	3,516	986	7.76%	4.72%	3.03%		
AADT	136,475	4,392	122,610	5,856	2,762	854	6.94%	4.29%	2.65%		
AWDT	143,481	4,907	127,108	7,029	3,385	1,053	7.99%	4.90%	3.09%		

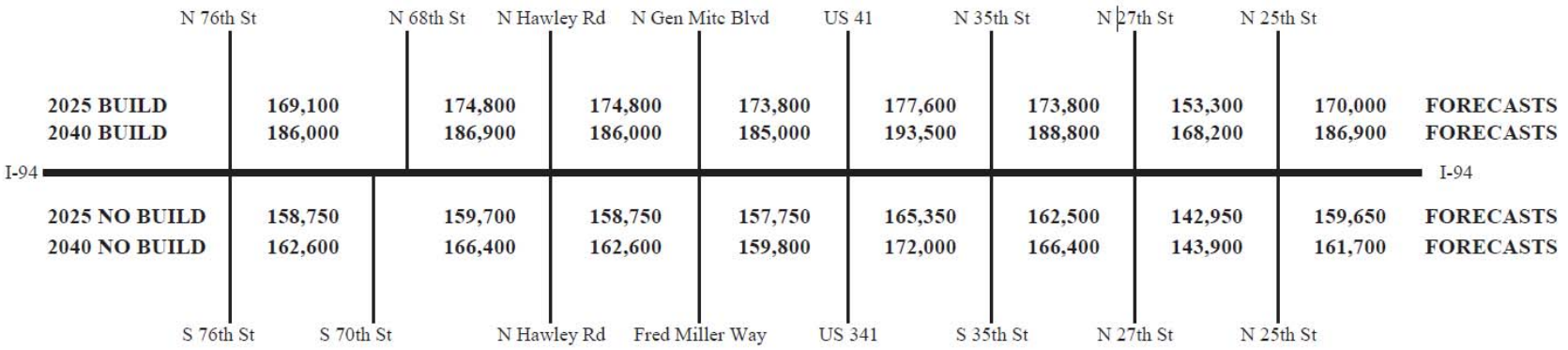
Wisconsin Department of Transportation

Annual % Length Distribution for 2011

Site Names: 400003, 1787, SE
County: Milwaukee
Funct. Class: U Principal Arterial - Interstate
Location: I-94 - AT 26TH ST MILWAUKEE

	Roadway	Neg DIR	Pos DIR	Neg1	Neg2	Neg3	Pos3	Pos2	Pos1
0 - 9	8.7	17.8	1.5	22.6	25.6	2.9	1.4	1.7	1.5
9 - 24	87.6	80.1	93.6	75.7	71.8	95.3	96.7	92.1	92.7
24 - 40	2.1	1.1	2.9	1.0	1.2	1.0	1.4	3.5	3.2
40 - 75	1.1	0.9	1.2	0.6	1.3	0.7	0.4	1.4	1.7
> 75	0.5	0.1	0.8	0.1	0.1	0.1	0.1	1.2	0.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	100.0

I-94 EAST-WEST CORRIDOR STUDY
FUTURE YEAR FORECAST ANNUAL AVERAGE DAILY TRAFFIC UNDER BUILD AND NO-BUILD SCENARIOS ALONG I-94 SEGMENTS FROM 70TH STREET TO 25TH STREET



APPENDIX D

Year 2025 Forecast Average Daily Traffic Diversion Under The Year 2035 Regional Transportation System Plan

Notes:

1. Under the No-Build Scenario these trips would not use the freeway, and instead would primarily use principal arterials. The principal arterial proportion (0.041) was applied to estimate the total number of trucks diverted.
2. Under the No-Build Scenario these trips would not use the freeway, and instead would primarily use minor arterials. The minor arterial proportion (0.025) was applied to estimate the total number of trucks diverted.
3. Under both the Build and No-Build Scenarios these diverted trips use IH 43 north of the Marquette Interchange (2800 Vehicles) and IH 794 east of the Marquette interchange (2800 Vehicles). The truck proportions from these two locations were applied to estimate the total number of trucks diverted (165 = (2800*0.021) + (2800 * 0.038)) and then proportioned between the three routes based on the proportionate share of the total diversion attributed to each route.
4. Under both the Build and No-Build Scenarios these diverted trips use IH 94 east of the stadium interchange, so the truck proportion (0.037) for the east segment of the corridor study was applied to estimate the total number of trucks diverted.
5. Under both the Build and No-Build Scenarios these diverted trips use IH 94 west of the stadium interchange, so the truck proportion (0.067) for the west segment of the corridor study was applied to estimate the total number of trucks diverted.
6. Under the No-Build Scenario these trips would use the IH 894 corridor instead of the IH 94 corridor. An average of the truck proportions (0.114) on IH 894 was applied to estimate the number of trucks diverted.
7. Trucks prohibited from this facility, so no trucks were estimated to be diverted.

Truck proportions provided in Appendix C and from the 2001 and 2009/2010 editions of the WisDOT publication entitled Wisconsin Vehicle Classification Data.

I-94 EAST-WEST CORRIDOR STUDY: YEAR 2025 FORECAST ANNUAL AVERAGE DAILY TRAFFIC DIVERSION UNDER THE BUILD SCENARIO RELATIVE TO THE NO-BUILD SCENARIO

FORECAST WORK ORDER: MAJOR WO#10
MASTER CONTRACT: 0669-20-52
ROUTE: I-94
LOCATION DESCRIPTION: S. 70TH STREET TO S. 25TH STREET
COUNTY: MILWAUKEE
FORECAST YEARS: 2025
PREPARED BY: C. HIEBERT, G. ALE
DATE: JUNE 14, 2013

FORECAST YEAR 2025 ANNUAL AVERAGE DAILY TRAFFIC DIVERSION FROM NO-BUILD CONDITION

FORECAST YEAR 2025 ANNUAL AVERAGE DAILY TRUCK DIVERSION FROM NO-BUILD CONDITION

TRUCK PERCENT (YEAR OF DATA)

Note_points

Comp_2025b_2025nb_Link

Comp_2025b_2025nb_Link

0 0.1 0.2 Miles

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

WWW.SEWRPC.ORG MILWAUKEE OZAUKEE WASHINGTON WAUKESHA RACINE WALWORTH

06/18/2013
V:\Forecasts\WisDOT\IH 94\EIS_NoBuild\forecast_analysis\I94_EW_y2025_Build_Diversions.mxd

APPENDIX E

MOVES2010a Regional Sensitivity Analysis Executive Summary

Publications and Papers

Introduction | Executive Summary

MOVES2010a Regional Sensitivity Analysis

Executive Summary

This document discusses the sensitivity of various input parameter effects on emission rates using the US Environmental Protection Agency's (EPA's) MOVES2010a1 model (20100830 database) at the regional level. Pollutants included in the study are carbon monoxide (CO), Oxides of Nitrogen (NOX), Particulate Matter of less than 2.5 micrometers (PM2.5), and Volatile Organic Compounds (VOCs). Similar trends for PM10 as reported for PM2.5 and Nitrogen Dioxide (NO2) as NOX exist, and inferences to these pollutants may also be made. Results are presented using the predicted emission rates (grams/mile) for running exhaust and starts across multiple Motor Vehicle Emission Simulator (MOVES) source types.

The input parameters varied in this analysis are: Temperature, Humidity, Ramp Fraction, Age Distribution, Analysis Year, and Average Speed Distribution. The input parameters of Road Type Distribution, Source Type Population, Age Distribution, Fuel, and Inspection and Maintenance (I/M) Programs were held constant utilizing the national default values from the MOVES 20100830 default database for the 2010 Analysis Year. MOVES is a complex model with many input parameters that can influence the emission rates across multiple vehicle types. The overall modeling process may include many variations and is not covered by this report. A separate project level analysis will delve more into the overall modeling process.

The results of the model sensitivity are presented for various vehicle types utilizing particular fuel types to provide an understanding of the input sensitivity independent of fleet mixture. The emission rate values are included in the results tables located in Appendices allowing the user to review the magnitude of the emissions rates across vehicle types. These data are specific for this sensitivity analysis and are not meant as absolute values for use in regional emissions analyses.

The methodology of the analysis used a local sensitivity analysis approach where a single input parameter was varied while all the other input parameters were held constant. The output emissions rates were analyzed across all MOVES vehicle types. To allow a comparison of these emission rates, a 'Baseline Case' was established. The Baseline Case used the default data from a National Scale MOVES run allowing national defaults for road type distribution, age distribution, average speed distribution, fuel, ramp fraction, and I/M programs. In order to run MOVES in a time efficient manner, a surrogate model approach was utilized to represent a county level analysis while executing MOVES for a single hour of the day. The surrogate approach utilizes a less computationally expensive method of running MOVES to obtain the overall sensitivities. A single hour was sufficient to establish the trends associated with the various model sensitivities as input parameters were varied.

While described in detail within the report, the basic findings for each evaluated parameter are presented:

- Temperature is a very sensitive parameter across all pollutants and vehicle types. The results from this analysis showed similar trends to the temperature and humidity sensitivity analysis conducted by EPA.
- Analysis Year is a very sensitive parameter especially between the years 2010 and 2020 where emission rates are seen to decrease most significantly. Emission rates further decline until the year 2040 and remain relatively unchanged thereafter. Given the analysis year requirements, prescribed for regional conformity determinations, users may not have a lot of flexibility in varying this input parameter.
- Age Distribution of the vehicle fleet is important. A proportional increase of 10 percent in the distribution of vehicles less than 10 years old caused a reduction in vehicle emission rates by approximately 16 percent for CO, 12 percent for NOX, and 11 percent for PM2.5. As expected, an older fleet with a 10 percent greater distribution of vehicles between 11 and 20 years old resulted in an increase in emission rates across all pollutants. This trend continued when increasing the proportion of the oldest set of vehicles between 21 and 30 years old as well. It is desirable for the users to obtain local vehicle age distribution data instead of relying on default information. This is especially true if the area's fleet consists of newer vehicles or if vehicle replacement programs are in effect.
- Ramp Fraction can be a sensitive input parameter dependent on vehicle and fuel type. A common observation for almost all vehicle types across all pollutants was that emission rates and ramp fraction change in a linear manner. As the ramp fraction increases, so do emissions rates. Diesel emissions of CO remained relatively flat showing a dependence on fuel type within the model. Alternatively, the emissions rate for PM2.5 showed an increase for diesel fueled vehicles with increased ramp fraction while gasoline emissions remaining somewhat constant. This parameter will be greatly controlled by the highway geometric design.
- Emission rates for NOX and CO were the most sensitive pollutants due to changes in humidity. In the case of CO, gasoline fueled vehicles showed increased emissions as humidity increased, while for NOX, diesel fueled vehicles were most affected. All other vehicle types remained relatively insensitive to changes in humidity.
- The emission rates associated with Average Speed Distributions representing Level-of-Service (LOS) B, C, and D generally varied by only a few percentage points across all pollutants and vehicle types. Results for CO varied for all vehicle types and should be examined individually by the reader in the full report. The emissions rates associated with LOS E showed a larger variation than LOS B, C or D, while emission rates associated with LOS F were significantly higher. The 'Baseline case' exhibited an emission rate between LOS E and F. Use of default values results in a LOS E+ speed to volume relationship, which in turn indicates a conservative bias for the MOVES default values. This is an indication that local data should be obtained and used when possible. The functional classification for arterials show a much greater change in emission rates for varying LOS than all other facility types.

The analyst should be aware of how all of these variables affect a regional analysis and the information of this report should inform in that regard. This provides an awareness of the importance of inputs during the design phase of projects and could result in a better analytical design in regards to air quality. Default data or assumptions should not be used if it is possible to obtain local data. This is especially true for vehicle age distribution and average speed distribution with related drive schedules. For example, defaulting to the MOVES average speed distribution would result in a LOS E+ being used during analysis. This heavy congestion may not exist or may not be the outcome of a final design and if used could result in higher emission rates than would occur if the actual speed distribution were used. Temperature and humidity are location specific. The analysis year will be defined by conformity guidelines. Omitting these two input parameters, the order of impact for including actual data would be:

- Average speed distribution for arterials
- Vehicle age distribution
- Ramp fraction
- Average speed distribution for interstates
- Average speed distribution for freeways.

Use of local data inputs is generally considered to provide the most accurate on-road mobile source emissions estimates.

APPENDIX F

Motor Vehicle Emissions Simulator (MOVES) Emission Factor Analysis

Motor Vehicle Emissions Simulator (MOVES) Emission Factor Analysis

Based on prior MOVES modeling conducted by WDNR for a highway project in Wisconsin, fine particulate matter emission factors decreased from 2015 through 2030 as follows:

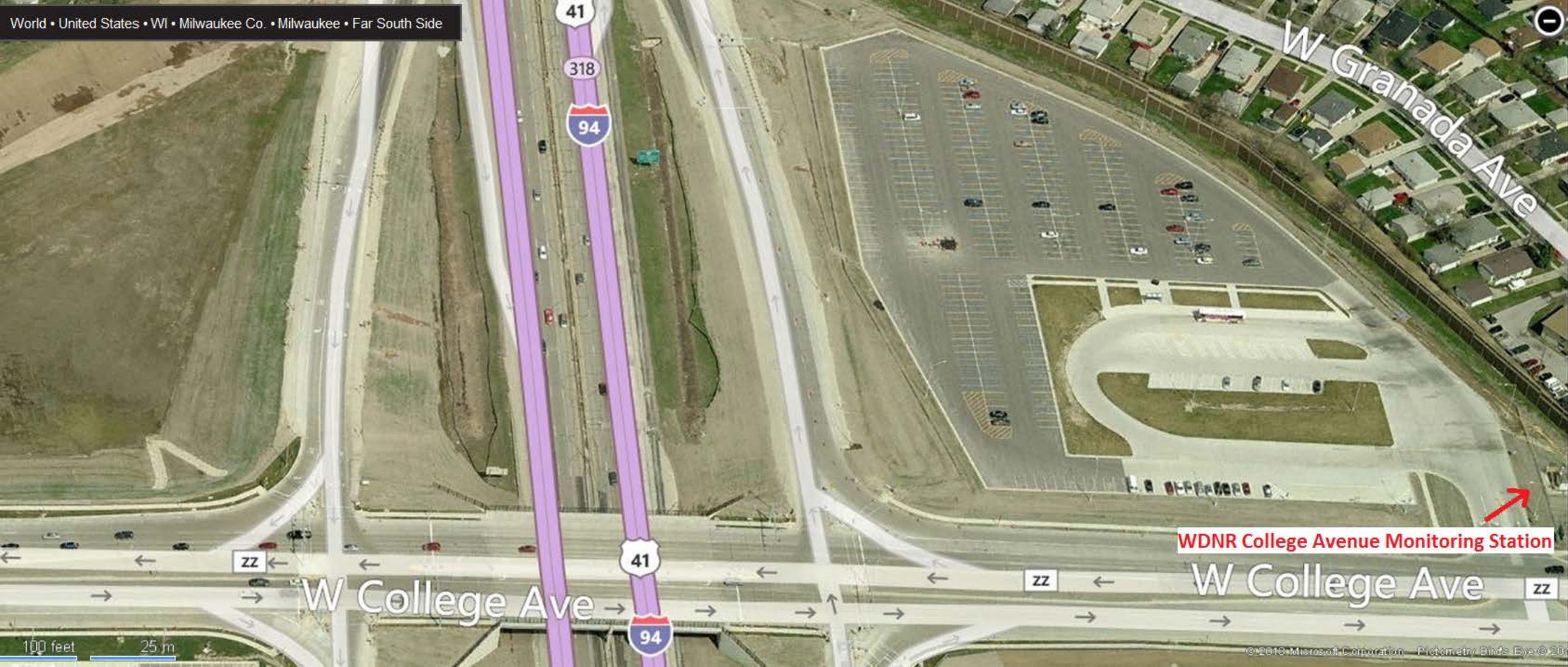
Year	Vehicle Type	$PM_{2.5}$ Emission Factor (grams per vehicle-mile)		
		January	July	Average
2015	All Gasoline and Light-Duty Diesel	0.0353	0.0105	0.0229
	Heavy-Duty Diesel	0.4059	0.4059	0.4059
	All Vehicles	0.0668	0.0441	0.0555
2030	All Gasoline and Light-Duty Diesel	0.0265	0.0074	0.0170
	Heavy-Duty Diesel	0.0701	0.0701	0.0701
	All Vehicles	0.0307	0.0134	0.0221
2040	All Gasoline and Light-Duty Diesel	0.0269	0.0076	0.0173
	Heavy-Duty Diesel	0.0281	0.0281	0.0281
	All Vehicles	0.0271	0.0097	0.0184

Vehicle Type	Percent Decrease (2015 - 2030)		
	January	July	Average
All Gasoline and Light-Duty Diesel	-24.8%	-29.6%	-25.9%
Heavy-Duty Diesel	-82.7%	-82.7%	-82.7%
All Vehicles	-54.0%	-69.6%	-60.2%

Vehicle Type	Percent Decrease (2015 - 2040)		
	January	July	Average
All Gasoline and Light-Duty Diesel	-23.7%	-27.7%	-24.6%
Heavy-Duty Diesel	-93.1%	-93.1%	-93.1%
All Vehicles	-59.4%	-78.0%	-66.8%

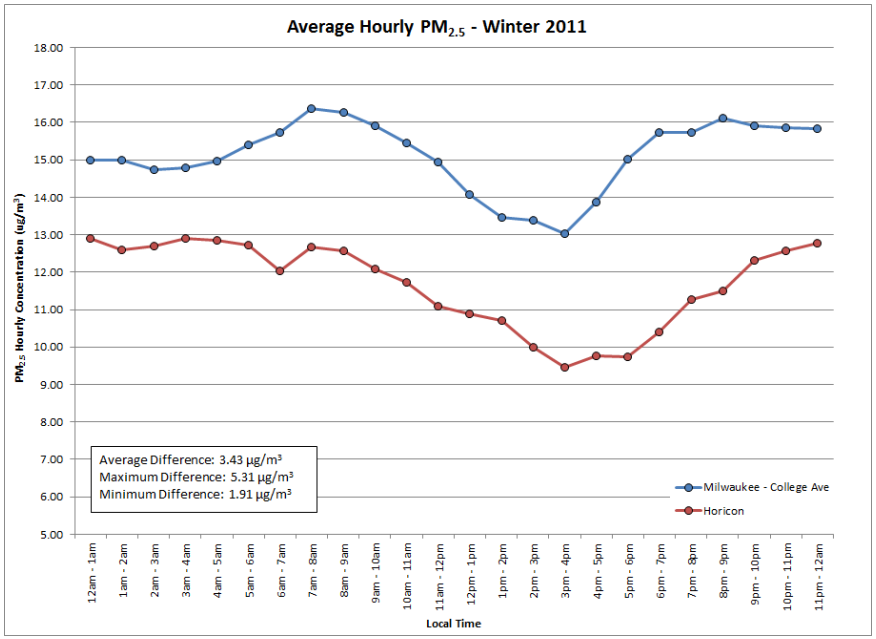
APPENDIX G

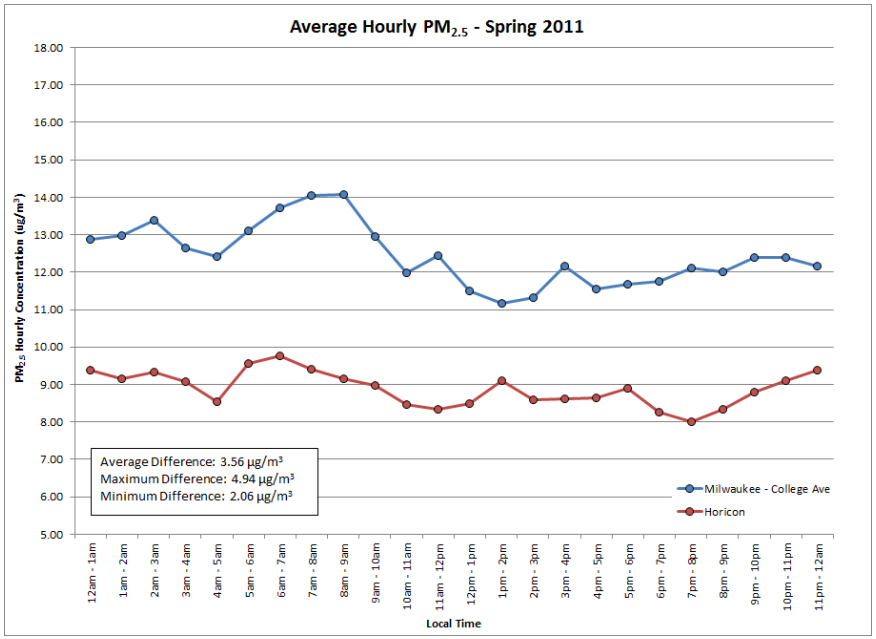
College Avenue WDNR
Monitoring Station Location

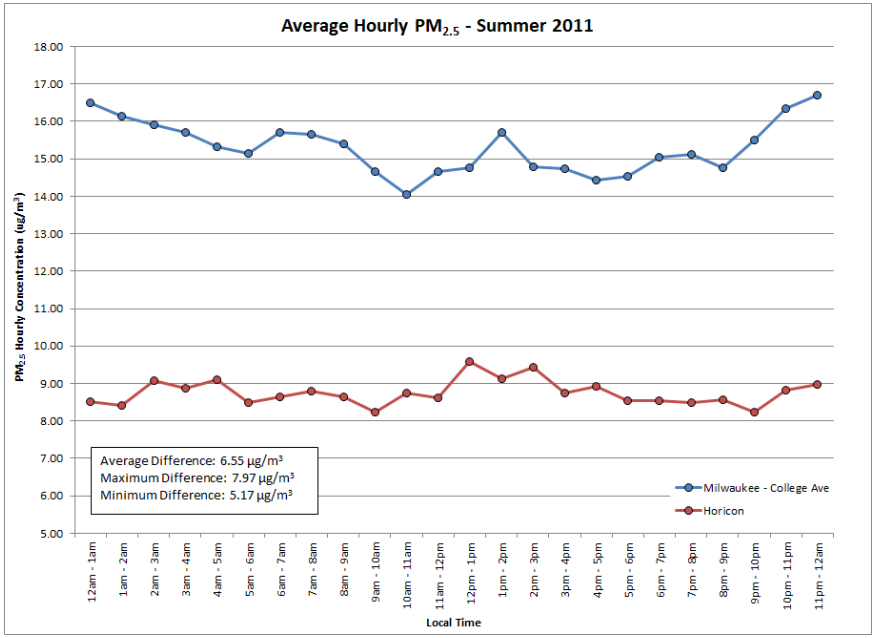

World • United States • WI • Milwaukee Co. • Milwaukee • Far South Side
41
318
94
W Granada Ave
WDNR College Avenue Monitoring Station
ZZ
W College Ave
41
94
ZZ
W College Ave
ZZ
100 feet
25 m
© 2013 Microsoft Corporation Pictometry Birds Eye © 20

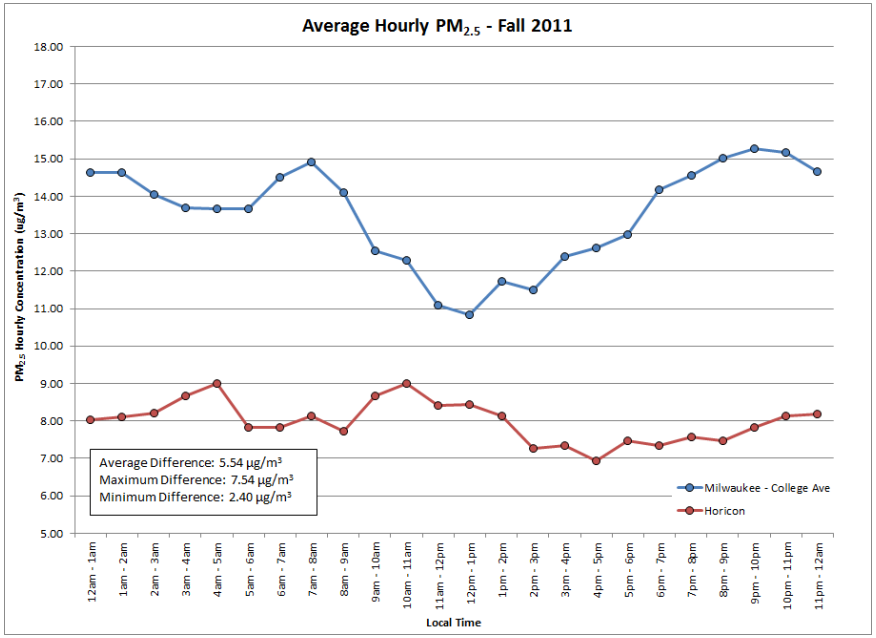
APPENDIX H

Comparison of Average Hourly $PM_{2.5}$ Concentrations at the College Avenue (Milwaukee) and Horicon Monitoring Sites


Average Hourly PM2.5 - Winter 2011
PM2.5 Hourly Concentration (ug/m³)
Local Time
Average Difference: 3.43 µg/m³
Maximum Difference: 5.31 µg/m³
Minimum Difference: 1.91 µg/m³
Milwaukee - College Ave
Horicon

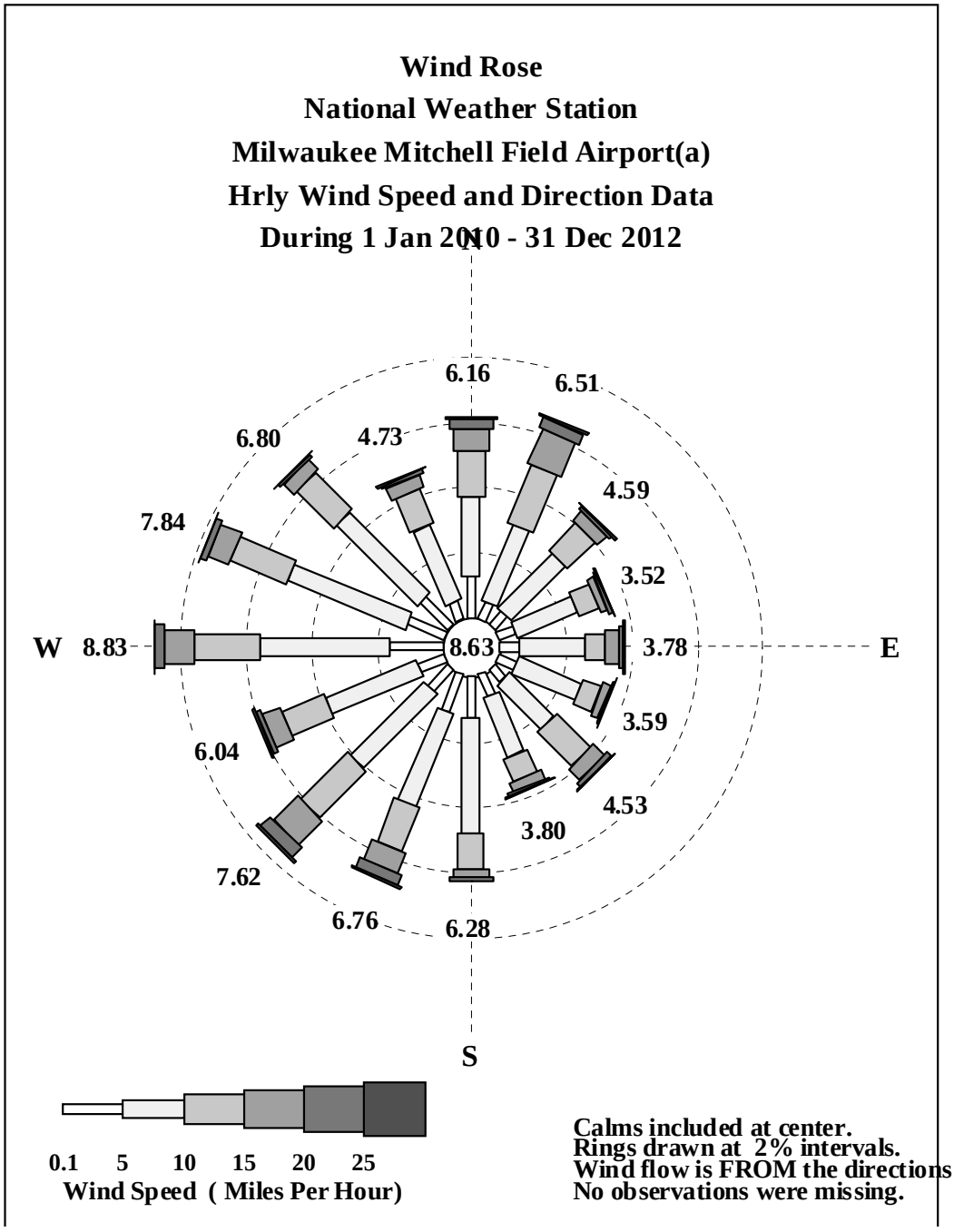

Average Hourly PM2.5 - Spring 2011
PM2.5 Hourly Concentration (ug/m³)
Local Time
Average Difference: 3.56 µg/m³
Maximum Difference: 4.94 µg/m³
Minimum Difference: 2.06 µg/m³
Milwaukee - College Ave
Horicon


Average Hourly PM2.5 - Summer 2011
PM2.5 Hourly Concentration (ug/m³)
Local Time
Average Difference: 6.55 µg/m³
Maximum Difference: 7.97 µg/m³
Minimum Difference: 5.17 µg/m³
Milwaukee - College Ave
Horicon


Average Hourly PM2.5 - Fall 2011
PM2.5 Hourly Concentration (ug/m³)
Local Time
Average Difference: 5.54 µg/m³
Maximum Difference: 7.54 µg/m³
Minimum Difference: 2.40 µg/m³
Milwaukee - College Ave
Horicon

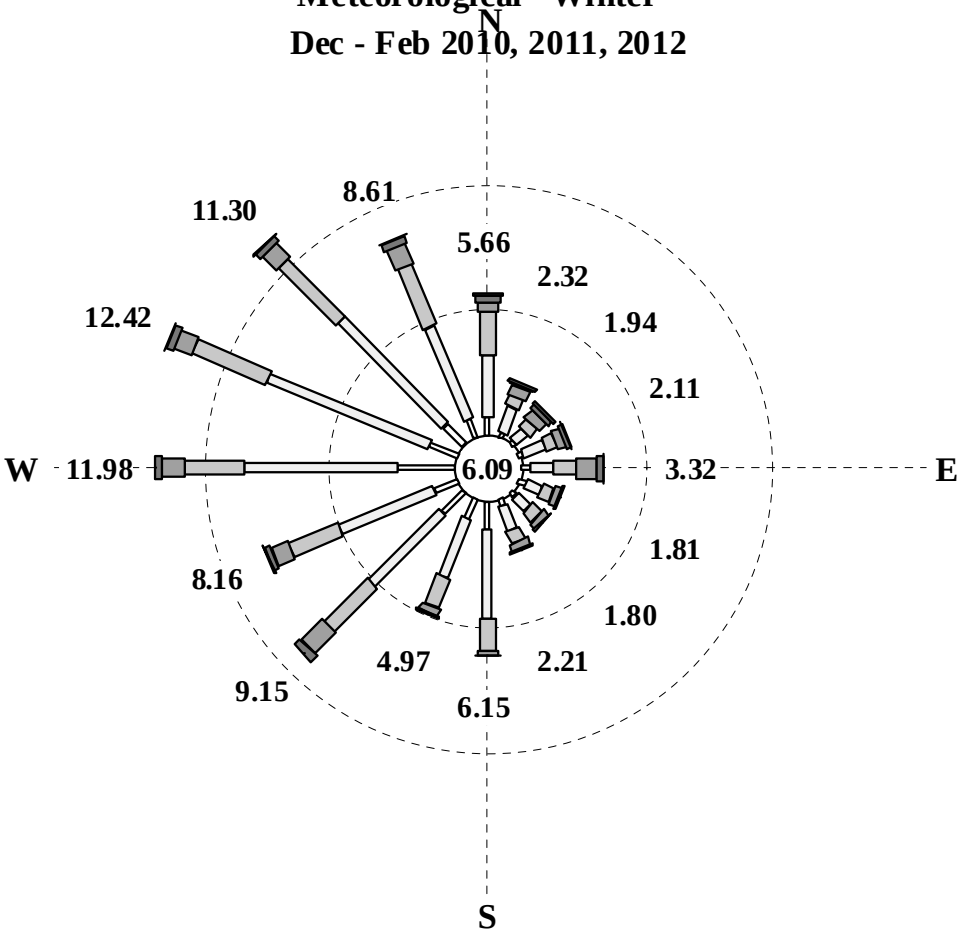
APPENDIX I

Wind Roses for the College Avenue WDNR Monitoring Station



(a) The National Weather Service (NWS) meteorological monitoring station at the Milwaukee Mitchell Airport ("MKE", 42.96 N Lat, 87.90 W. Lon.) is located approx. 2.1 km (1.3 miles) NNE of the WDNR monitoring site at the College Ave. Park and Ride Lot (42.92 N Lat, 87.91 W. Lon.). This relatively close distance makes the MKE meteorological data highly representative of the weather that the WDNR College Ave site witnesses. There are no wind measurements collected at the College Ave. site.

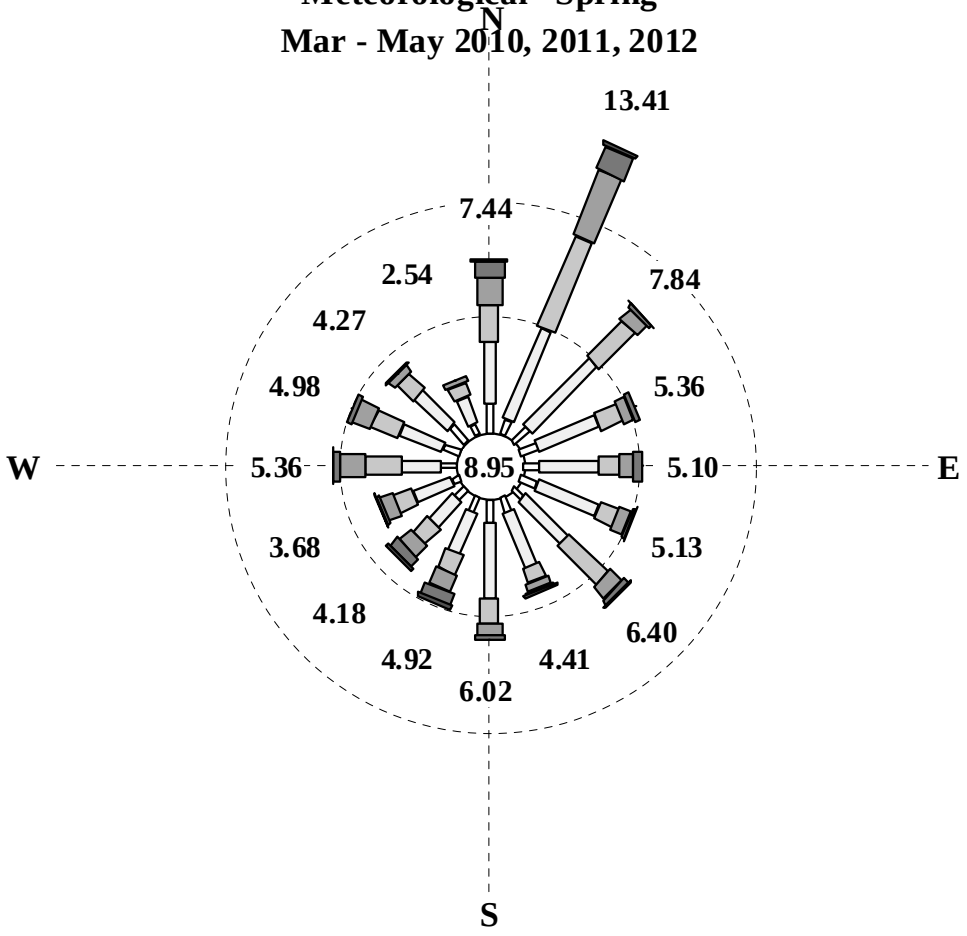
Wind Rose
National Weather Service
Milwaukee Mitchell Field Airport
Hrly Wind Speed and Direction Data
Meteorological "Winter"
Dec - Feb 2010, 2011, 2012



Wind Speed (Miles Per Hour)

Calms included at center.
Rings drawn at 5% intervals.
Wind flow is FROM the directions shown.
No observations were missing.

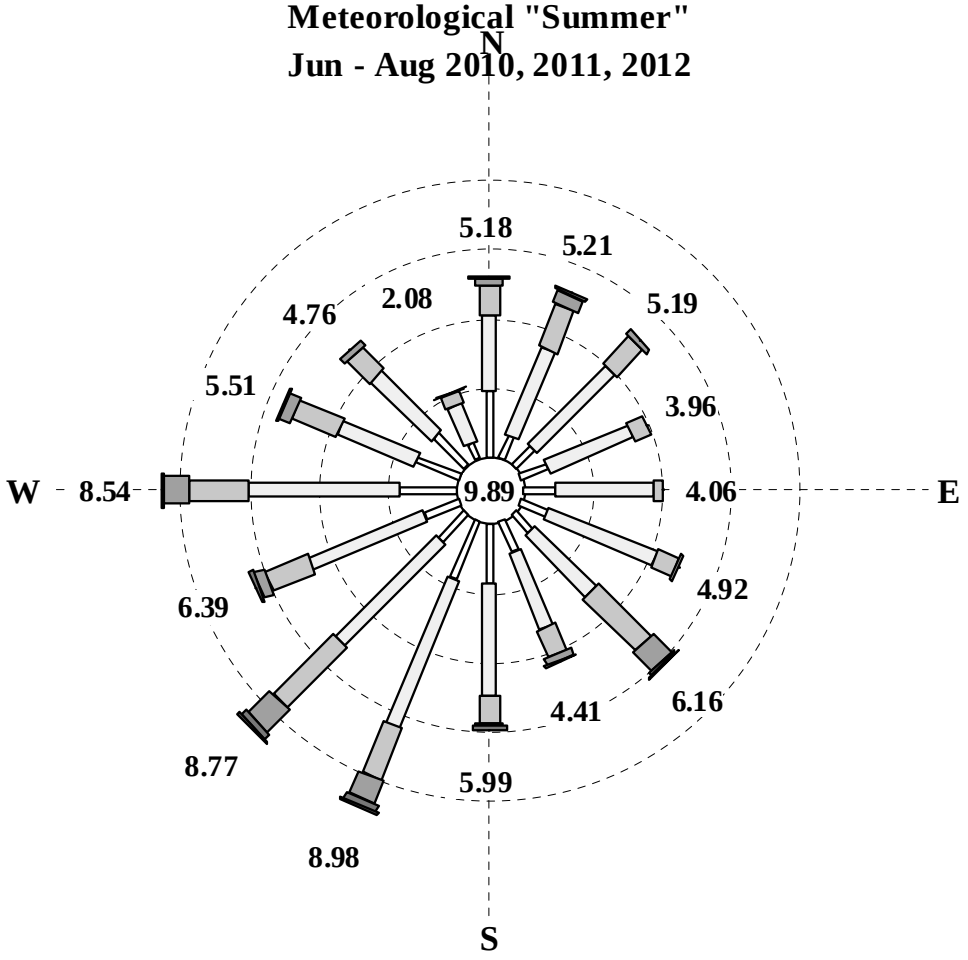
Wind Rose
National Weather Service
Milwaukee Mitchell Field Airport
Hrly Wind Speed and Direction Data
Meteorological "Spring"
Mar - May 2010, 2011, 2012

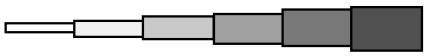


Wind Speed (Miles Per Hour)

Calms included at center.
Rings drawn at 5% intervals.
Wind flow is FROM the directions shown.
No observations were missing.

Wind Rose
National Weather Service
Milwaukee Mitchell Field Airport
Hrly Wind Speed and Direction Data
Meteorological "Summer"
Jun - Aug 2010, 2011, 2012

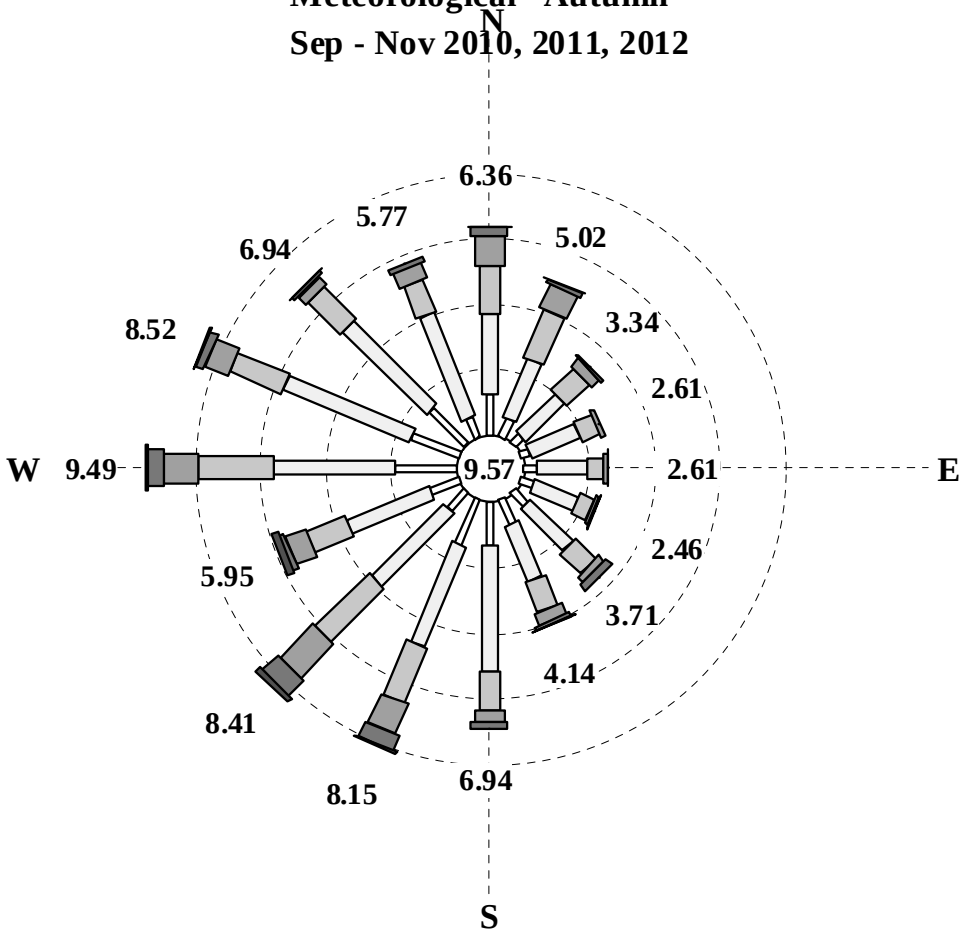


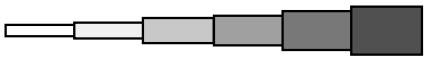


Wind Speed (Miles Per Hour)

Calms included at center.
Rings drawn at 2% intervals.
Wind flow is FROM the directions shown.
No observations were missing.

Wind Rose
National Weather Service
Milwaukee Mitchell Field Airport
Hrly Wind Speed and Direction Data
Meteorological "Autumn"
Sep - Nov 2010, 2011, 2012





Wind Speed (Miles Per Hour)

Calms included at center.
Rings drawn at 2% intervals.
Wind flow is FROM the directions shown.
No observations were missing.

APPENDIX J

WisDOT Activities That Positively Impact Wisconsin's Air Quality

WisDOT's Inspection and Maintenance (I/M) Program

- Insures that emissions are minimized as vehicles age in SE Wisconsin. Now includes inspection of diesel vehicles.

Engine retrofit programs – DERA and CMAQ Grants

- WisDOT administered a $750K EPA Diesel Emissions Reduction Act (DERA) grant that replaced older diesel engines with cleaner technologies in construction vehicles (44 vehicles). Significant portions of the money were secured by contractors who frequently work on WisDOT-SE projects (i.e. Lunda, Michels, Zenith Tech, etc.).
- WisDOT's Congestion Mitigation and Air Quality (CMAQ) Program also funded the installation of exhaust retrofit devices for school bus and municipal fleets in SE Wisconsin (up to 549 vehicles retrofitted).

New Idling Restrictions On Trucks

- WisDOT construction specifications often include recommended idling restrictions on contractor vehicles.

Congestion / Traffic Mitigation Efforts

- WisDOT STOC synchronized and adaptive traffic signals, and trailblazing signs.
- 511 Real-Time Traffic System.
- Increased efficiency to incident management and response (WisDOT funded).

Multi-Modal Development

- WisDOT administered $15M of CMAQ funds during the past 3 years to support operation of express bus routes and the replacement of older buses in SE Wisconsin.
- WisDOT CMAQ funds are supporting Amtrak platform reconstruction in SE Wisconsin. The platform expansion is expected to increase commuter ridership through greater accessibility.
- WisDOT is evaluating increased Milwaukee-Chicago intercity passenger rail ridership on Amtrak Hiawatha through expanding schedules.
- WisDOT CMAQ funds will be applied to the acquisition of lands to complete the Ozaukee to Downtown Milwaukee Connector Bike Path.
- WisDOT's SE Region successfully facilitates employee telework and rideshare programs.

Community Outreach and Air Quality Awareness

- The WisDOT is a participating member of the Wisconsin Partners for Clean Air and the Wisconsin Clean Diesel Coalition (>300 government, public, and private stakeholders).
- WisDOT is committed to the improvement of SE Wisconsin's air quality through educational outreach and the development of a variety of funding mechanisms.

Reformulated Gasoline (RFG) and Alternative Fuel Sales

- RFG is sold in SE Wisconsin's nonattainment area to reduce smog-forming and toxic pollutants in the air.
- Cleaner-burning fuels such as compressed natural gas (CNG) are now sold at many filling stations.

Municipal Fleets Converting to Cleaner Technologies

- Many local utility, school, and transit vehicles are switching to alternative fuel, hybrid, and electric technologies.

Truck Idle Reduction Grant Program

- EPA's SmartWay Transport Program is promoting the installation of auxiliary power units and auto engine shutdown systems, as well as truck stop electrification, to reduce excessive freight truck idling.